NGV 5.1 Standard Review

Challenges of Commercialization of New Technology

Pete Ehlers

Program Manager, Alternative Energy Vehicles

Applicable Natural Gas Codes and Standards

Codes Coverage – NFPA 52, FMVSS 304 (CSA B108 Stations, CSA B109 Vehicles, CSA B51 Piping, CMVSS)

Standards Coverage - CSA NGV1, NGV2, NGV3.1, - Vehicle Component Standards

AGA 2-90 (CSA B149.1, CSA 12.6) – Home Refueling C&S

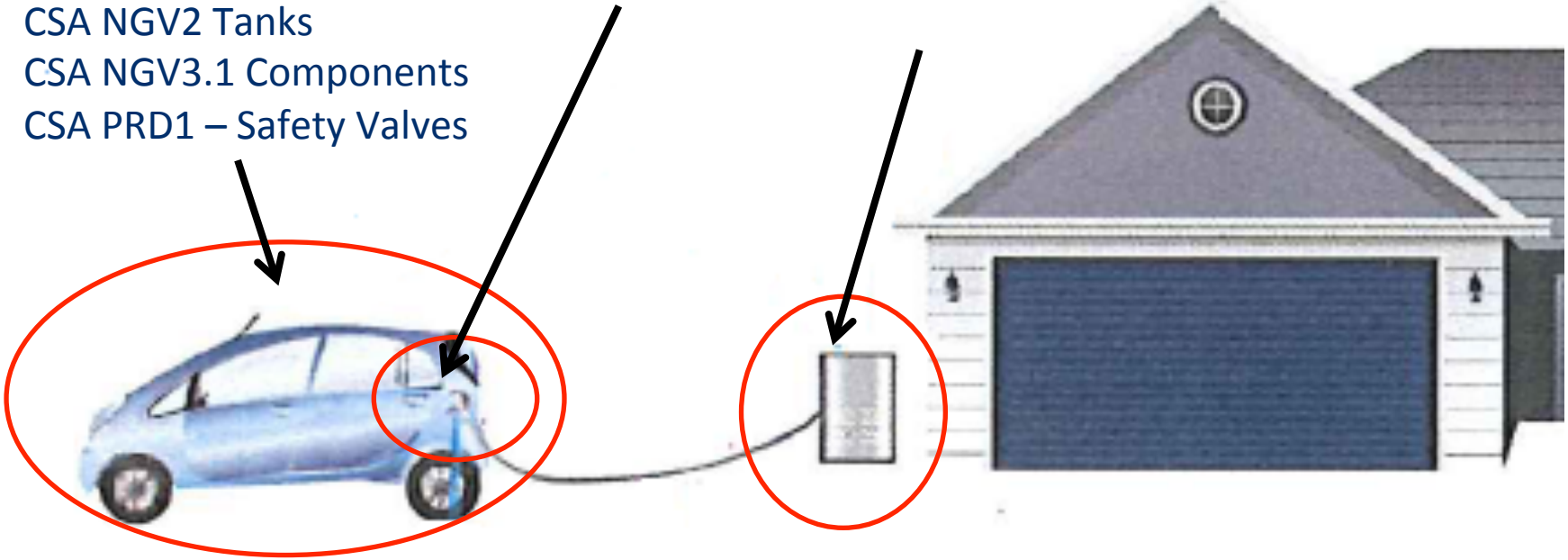
CSA NGV1, NGV 4.2, NGV4.4 Fueling Connection and Hose Assembly components

AGA 2-90 Home Fueling

CSA NGV2 Tanks

CSA NGV3.1 Components

CSA PRD1 – Safety Valves



Challenges for OEMs

- Current code / standards make it difficult for OEMs to determine design requirements
- Current codes / standards are very prescriptive limiting innovation new technology
- Lack of Harmonized standards between Canada and US
- Current requirements are focused on only one kind of OEM technology (one size of reciprocating compressor)
- No Nationally Recognized Standard(s) means no reference in the codes = Inconsistent AHJ response
- Codes structure limit supply chain options

CNG HRA Codes

- NFPA 52 Summary
  - Primary Reference NFPA 52 Chapter 10 – CNG RFF (Residential Fueling Facility) BUT *subject to approval of the AHJ.(Fire marshall)*
    - 5 scfm max flow for residential (36 scfm for industrial)
    - No onsite storage of compressed gas (residential) (external dryers?)
    - Device must be “listed” but no references indicated
    - Installation of the HRA must include a gas detector or use a design that achieves the equivalent of 1/5 LFL of NG @ 6 inches from ceiling.
    - Max. hose length 25 ft and must be retractable
    - An emergency shut-off valve must be present and accessible
    - External hose b-aways must comply with NGV4.4 – Internal B-aways fittings do not need to comply with NGV4.4
    - Requirement that the engine must be shut off during refueling but no interlock requirement btwn vehicle and HRA
    - Hoses and PRVs that require regular inspection must be maintained per manufacturers instructions but no enforcement is outlined

CNG HRA Standards

- AGA 2-90 – Product Listing Standard (non-ANSI)
  - Hoses must meet IAS I-93 (superseded by CSA NGV4.2)
  - Nozzles must meet CSA NGV1
  - Recognizes both P30 and P36 fill pressures
  - Device must be able to fill using temperature compensation algorithms – outlines performance requirements
  - Includes prescriptive requirements for
    - electrical wiring, components and grounding, gas valves, gas controls, compressors, motors, and fans, fittings and gas passageway connections
  - System performance requirements
    - Leakage – Strength – Temperature and Pressure Sensing – Pressure Relieving Means – Surface and Component Temps – Electrical and Rain Safety – Capacity Test – Durability – Impact / Drop – Marking / Adhesion / Legibility
  - Garage Requirements – Additional Certification Req's – Gas sensing, Gas Release, Chemical resistance
  - **No gas drying requirements outlined**

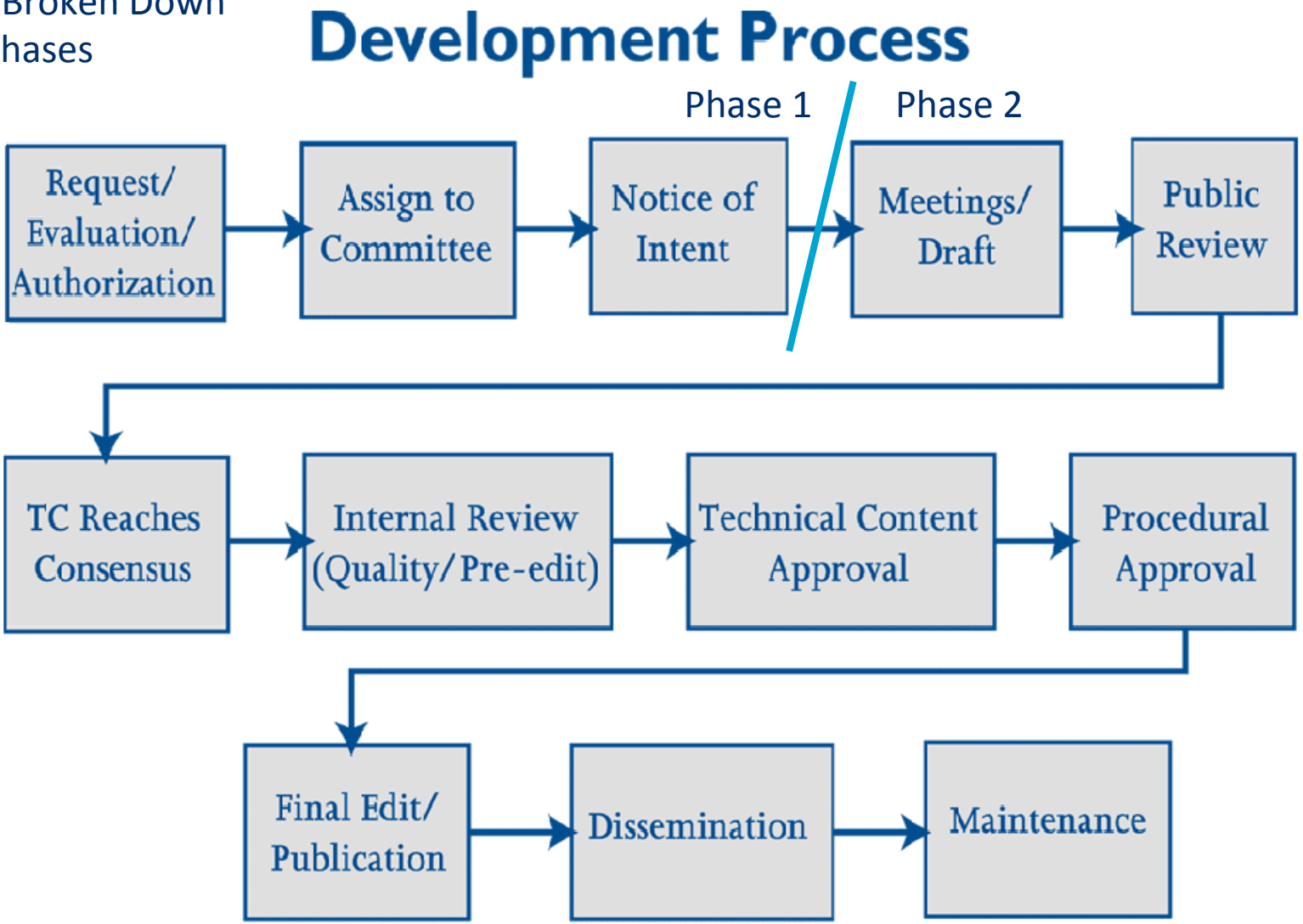
What is Required to Move Forward

Pete Ehlers
Program Manager, Alternative Energy Vehicles

CSA Group

CSA NGV5.1 Project

Project Broken Down into 2 Phases



CSA NGV5.1 Project

- Broken Down into 2 phases
  - Phase 1 – Fully Sponsored by AGA
    - File PINs with ANSI (Complete)
      - Set Preliminary Standards Scope
    - Development Membership for TAG according to ANSI Matrix Requirements (Ongoing)
      - Announcement made in CSA Newsletter and to existing membership base
      - Workshop on May 31, 2013 at CSA in Cleveland
        - » Supported by AGA, ANGA, and Drive Natural Gas Initiative
    - Gain Approval from the Auto TC for final TAG Scope and Standard Scope (Complete)
    - Additional Funding to be identified Prior to start of Phase 2 (Complete)
    - Move to Phase 2

CSA NGV5.1 Update

- **Scope revised by Workshop participants and approved by TC and sent to TSC.**

"This standard details mechanical, electrical and physical requirements for newly manufactured appliances that dispense natural gas for vehicles directly into the vehicle fuel storage system. This standard does not apply to the nozzles and hose assemblies covered by other standards."

CSA NGV5.1 Update

- **FINAL SCOPE FOR PROJECT AS ADJUSTED BY TSC**

"This standard details mechanical, electrical and physical requirements for newly manufactured appliances that dispense natural gas for vehicles directly into the vehicle fuel storage system. This standard does not apply to the nozzles and hose assemblies covered by other standards."

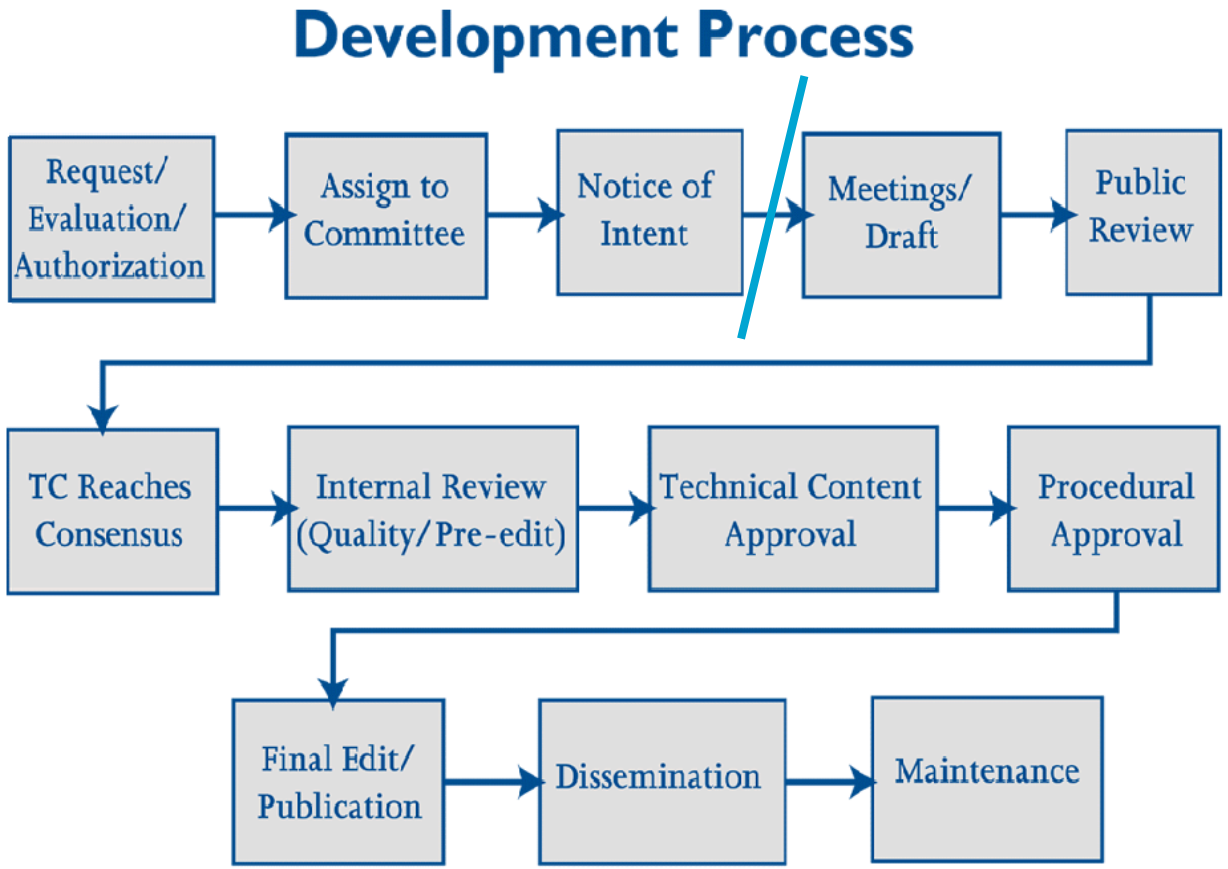
NGV5.1 Committee Members Assembled

- Technical Sub-Committee (TSC) consists of Representatives from:
  - Utilities
  - Component Manufacturers
  - System Integrators / Contractors
  - Refueling Device OEMs
  - Regulators
  - Certification and Testing Agencies
  - Industry Associations
  - Research / Academic Institutes

  - Continuously open to more members – CSA Group TSC membership is free.

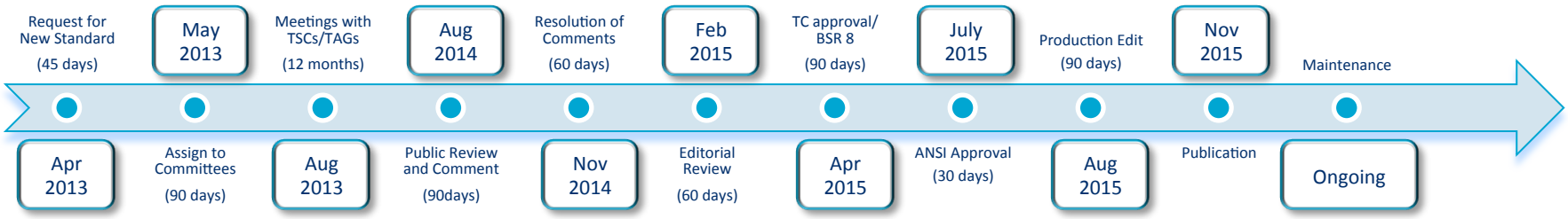
CSA NGV5.1 Project

- Phase 2
  - Complete the Development Process and Publish NGV5.1



NGV 5.1 Home Refueling Appliance

- VERY AGGRESSIVE PROJECT TIMELINE TO SUPPORT CODE CYCLES AND ACCELERATE EARLY ADOPTION OF HRAs



Project Milestones

CSA Group will provide Services in order to move this project through CSA Group's ANSI and SCC Accredited Standards Development Processes in order to create a Nationally Recognized Standard for Compressed Natural Gas Home Refueling Appliances.

The major Standards Development Process Milestones for this Project are outlined below:

- **Milestone 1.0 - Complete the development of a Draft Standard by TSC and gain their approval for Public Review – ONGOING!**
- **Milestone 2.0 - Complete Public Review of Draft Document – Managed by CSA Group**
- **Milestone 3.0 - Complete Editorial Review of Draft Document – Managed by CSA Group**
- **Milestone 4.0 - Complete Ballot of the Joint Automotive Technical Committee and Prepare Ballot Summary**
- **Mile Stone 4.1 - Complete ANSI BSR 8**
- **Milestone 5.0 - Complete Ballot Disposition from the TC and Provide Conflict Resolution Services**
- **Milestone 6.0 - Complete ANSI BSR 9 (ANSI approval granted)**
- **Milestone 7.0 - Publish as a Nationally Recognized Standard**
- **Milestone 8.0 – Project Close**

Project Update

- Seed document completed – Sept 10, 2013
  - Developed by a small team of experts (CSA and Industry) to accelerate activities of TSC
- Kick-off Meeting at CSA Group Standards Week in Cleveland, Ohio – Sept 26, 2013
- Weekly TSC teleconferences taking place to develop technical content and performance testing requirements

Critical C&S Dates and Deadlines

- **Revised Schedule for NFPA 52 Submission from NGV5.1 TSC**
  - DROP DEAD Proposal submitted to CSA Group Staff- **November 19, 2013**
  - CSA Group Staff post to Alt E COI no later than – **November 25, 2013**
  - Draft proposals on NFPA form (WORD FORMAT-for review ONLY) post to COI; TSC/TAG members comment on the rationale and revisions to ensure all areas covered and all potential supporting rationales are included. **WEDNESDAY, December 4 all comments must be in.**
  - Any additional changes/recommendations, etc. return to original proponent/working group by **Friday December 6**.
  - Revised and final approval of proposals- due back to TSC Staff by **Tuesday, December 10**
  - Staff post *revised* proposals to COI no later than – **December 12, 2013**
  - **VOTING on ALL PROPOSALS through COI- Open December 13- 17 (5 pm EASTERN TIME)**
  - Results of vote will be posted on the COI no later than **December 18**. If the software permits display of results – that will serve as the posting.
  - Proposed amendments will be submitted electronically through the NFPA website- **December 18-19 and 20, 2013**
  - **January 3, 2014**- NFPA Deadline

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Reference Slides

NGV 5.1 Scope Review

CSA Group

NGV5.1 Scope

- Scope summary submitted on ANSI PINs form

  “This standard details mechanical and electrical requirements for newly manufactured systems that dispense natural gas for vehicles directly into the vehicle fuel storage container and are installed in non-commercial/ non-public locations. This standard does not apply to the nozzle, hose assemblies and connection devices associated with such equipment.”

NGV5.1 Proposed Table of Contents

- **Part I Construction**
- 1.1 Scope and References
- 1.2 Power Systems
- 1.3 Physical Environment and Operating Conditions
- 1.4 Selection of Materials
- 1.5 General Requirements
- 1.6 Cabinets
- 1.7 Pressure Indicating Requirements
- 1.8 Pressure Equipment, Regulation, Valves, and Piping
- 1.9 Motors, Fans and Compressors
- 1.10 Inlet Gas Flow Controls
- 1.11 Protection of Service Personnel
- 1.12 Electrical Equipment and wiring
- 1.13 Safety Requirements And Protective Measures
- 1.14 Control Systems and Protective Pressure Components
- 1.15 Maintenance and Inspection
- 1.16 Marking, Labeling and Packaging
- 1.17 Installation of PRVs

NGV5.1 Proposed Table of Contents

- **Part II Performance**
- 2.1 General Requirements
- 2.2 Test Gases
- 2.3 Basic Test Arrangements
- 2.4 Strength Tests
- 2.5 Leakage Tests
- 2.6 Normal operation type test (including durability)
- 2.7 Electrical overload test
- 2.8 Shutdown Parameters
- 2.9 Temperature and Pressure Sensing
- 2.10 Pressure Relieving Means
- 2.11 Automatic Control of Pumps
- 2.12 Requirements Related to Temperature Compensation Systems
- 2.13 Surface and Component Temperatures
- 2.14 Dielectric Requirements
- 2.15 Rain Tests
- 2.16 Wind Tests
- 2.17 Impact and Drop Tests
- 2.18 Fuel Quality
- 2.19 Vent System Tests
- 2.20 Access to Energized Parts (Test Finger)
- 2.21 Special Requirements Related to Inside Residential Installations

NGV5.1 Proposed Table of Contents

- **Part III Routine Tests**
- 3.1 Leakage Test
- 3.2 Normal Operation Test
- 3.3 Dielectric Strength Test

- **Part IV Installation**
- 4.1 Installation
- 4.2 Installation of Emergency Shutdown Equipment
- 4.3 HAZOP Plan

May 31, 2013

Model Code Coverage: International Code Council (ICC)/International Fuel Gas Code (IFGC) Overview

NGV 5.1 Workshop
CSA Group
Cleveland, Ohio

Ted A. Williams
Director, Codes & Standards
American Gas Association

AGA American Gas Association

Model Codes (i.e., IFGC) Versus National Standards (i.e., NFPA 52)

MODEL CODES

- Serve as Templates for State and Local Codes
- Direct Adoption, Modification
- Building Official/Inspector Enforcement
- Installation Approvals Based on Listing and Marking (e.g., appliances)

Impacts/Implications:

- Simplified Enforcement – Service Marks
- Less Risk of Local Code Barriers
- More Opportunities for Mass Market and Multiple Channels

STANDARDS (i.e., for Systems – HRAs/VRAs)

- Technical Documents Based on Consensus Process (e.g., ANSI)
- Adoption Within Codes and/or Local Enforcement
- Fire Official Enforcement
- Installation Approvals Based on Technical Review to Standards Requirements
- Listing and Marking Important but To Some Degree Secondary to Standards Requirements

Impacts/Implications:

- Risks of Differences in Interpretation of Requirements from Fire Officials
- High Risk of Unique Local Requirements
- Reduced Market Certainty and Opportunities

IFGC Code Cycle for 2015 Edition: Key Activities

• Code Development Hearings, Dallas, TX	April 21 – 28, 2013
• Web Posting of "Report of the Public Hearing"	May 31, 2013
• Public Comments on Hearing Results Due	July 15, 2015
• Web Posting of Public Comments	August 28, 2013
• FINAL ACTION HEARING, Atlantic City, NJ	October 2 – 9, 2013

NFPA 52, "Vehicle Gaseous Fuel Systems Code," 2015 Edition

- **New Members Being Sought:**
  -- Technical Committee Members Representing "Users" and Alternates Among "Manufacturers"
  -- Task Group Members (not requiring Committee membership)

- **Chapter 8: "CNG Residential Fueling Facilities (RFF-CNGs)"**
  -- T. Williams, Task Group Leader/D. Horne, Member

- **Reformatting of Document by Task Groups – August 1, 2013**

- **Due Date for Substantive Proposals (Technical Committee and Public) – January 3, 2014.**

Recommendations

Codes and Standards is Not a Spectator Sport … Stakeholders Need to Get and Stay Engaged

Recommended Actions for Model Codes and Current Cycle of the IFGC, 2015 Edition:

- Participate In and Fully Support **Listing Standards Development** for Residential Fueling Appliances (i.e., **NGV 5.1**)
- Participate In Revisions to **NFPA 52** (the source of the 5 scfm limitation)
- Develop and Submit **Public Comments on the IFC Committee Action** on FG1-13 by July 15, 2013
- Participate in the **FINAL ACTION HEARING**, October 2 – 9, 2013.

AGA
American Gas Association

www.aga.org

The American Gas Association, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 71 million residential, commercial and industrial natural gas customers in the United States, of which 92% — more than 65 million customers — receive their gas from AGA members. Today, natural gas meets almost one-fourth of the United States' energy needs.